

Nutrient intake and meal patterns of Micmac Indian and Caucasian women in Shubenacadie, NS

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North American Indians have a higher morbidity from gallbladder disease, diabetes mellitus and obesity than other North Americans; this may result from their food intake. Nutrient intake and meal patterns were compared in 120 Micmac Indian and 115 Caucasian women in Shubenacadie, NS. Findings were compared with the Canadian Dietary Standard (CDS) and the Nutrition Canada national and Indian survey reports. The diet of Indian women had higher carbohydrate, lower protein and lower fibre content than that of Caucasian women, who derived a higher percentage of energy from protein and had a higher intake of vitamin A, niacin and ascorbic acid. Overnight fast was longer among Indian women. A high percentage of all women studied reported diets that did not reach the CDS for total energy intake in kilocalories or for calcium, iron, vitamin A, thiamin or riboflavin.

Les Indiens d'Amérique du Nord présentent une plus forte morbidité due à une affection de la vésicule biliaire, au diabète mellitus et à l'obésité que les autres Nord-Américains; ceci peut être causé par leur alimentation. On a comparé l'apport et les habitudes alimentaires de 120 Indiennes Micmac et de 115 Caucasiennes de Shubenacadie, N-E. Les résultats ont été comparés aux Normes Diététiques Canadiennes (NDC) et aux rapports des enquêtes nationale et indienne de Nutrition Canada. Le régime alimentaire des Indiennes avait une teneur supérieure en hydrate de carbone, contenait moins de protéines et de fibres que celui des Caucasiennes qui, pour leur part, tiraient un plus fort pourcentage de leur énergie des protéines et qui avaient un plus grand apport en vitamine A, en niacine et en acide ascorbique. Le jeûne de la nuit était plus long chez les Indiennes. Un fort pourcentage des femmes qui ont participé à l'étude ont signalé des régimes alimentaires qui ne rencontraient pas les NDC pour l'apport total d'énergie en kilocalories ou pour le calcium, le fer, la vitamine A, la thiamine ou la riboflavine.

Altered eating habits among native peoples of North America appear to have caused metabolic-hormonal adaptations that have produced various metabolic problems.¹ Traditionally the diet of native peoples tended to centre on meat (as in the case of Inuit, northern bush Indians,^{1,2} various tribes in British Columbia and Micmac Indians in the Maritimes) or vegetables (as in the case of the Pima and Papago Indians of the southwestern United States,^{3,4}). However, in the recent past, these people have adopted a mainly carbohydrate diet. Studies show that illness due to gallstone disease,⁵ diabetes mellitus⁶ and obesity^{3,4} is now more prevalent in Indians than in the general population of North America.⁷ Apparently these health problems are directly related to the changes in food intake.

We found a high prevalence of gallstones (211/1000) among Nova Scotia Micmac Indian women who were obese and parous.⁸ Preliminary results⁹ of a study in a Caucasian group indicated a lesser prevalence of gallstones (108/1000) and the final results (unpublished) disclosed a prevalence of 167/1000. In the study reported below we compared nutrient intake, meal patterns and use of traditional Indian foods by Micmac women living on a reserve near Shubenacadie, NS with findings in Caucasian women in the nearby town of Shubenacadie.

Methods

There were 132 Indian and 133 Caucasian women aged 15 to 50 years available for study from October 1973 to June 1976. The women in both populations were approached on a door-to-door basis by one interviewer, and questionnaires on medical history, pain and dietary habits were completed. Each woman was asked to keep a food record for 4 consecutive days, including 1 weekend day, indicating the times of meals and amounts and methods of preparation of food models and dishes. These records were collected within a week and were reviewed by the interviewer and subject. Eight women, chosen randomly, kept summer food records as well. A meal was considered as such if the minimum content of fat was at least 7 g, the amount required to contract the gallbladder. Calorie range represented the maximum difference in total energy intake in kilocal-

ories within the 4 days. Height, weight and tricep skinfold thickness were measured during the first interview. From the height in inches and weight in pounds the ponderal index (ht/\sqrt{wt}) and body build index (wt/ht^2) were calculated. The intakes of nutrients were calculated from standard food tables.¹⁰⁻¹² The data were analysed by means of the Mann-Whitney test for two independent samples and the paired *t*-test.

Results

The food record was completed by 120 of the 132 Indian women and 115 of the 133 Caucasian women. The median daily intakes of 28 nutrients and other nutritional measures are shown in Table I. The Caucasians consumed significantly ($P = 0.0006$) more protein, which accounted for a significantly ($P = 0.00001$) greater percentage of their total energy intake, and significantly more niacin ($P = 0.008$), vitamin A ($P = 0.03$) and fibre ($P = 0.003$) whether the total energy intake was high or low; they also drank more alcohol ($P = 0.001$) and had a shorter overnight fast ($P = 0.027$). The Indian women derived a significantly ($P = 0.002$) greater percentage of their total energy intake from carbohydrates and had a larger calorie range ($P = 0.026$) whether the total energy intake was high or low. There was no significant difference in obesity between the two populations.

The daily intake of nutrients of the two groups is compared with the Canadian Dietary Standard (CDS)¹³ in Table II. Approximately 74% of respondents in both groups consumed less than 2100 Cal/d, but in spite of the low energy intake 52.5% of the Indian and 40.0% of the Caucasian women were obese according to the ponderal index, the normal being less than 12.5%.^{14,15} Less than 4 g of fibre was consumed daily by 88.3% of the Indian and 79.1% of the Caucasian women, the recommended range being 4 to 7 g. The proportion of respondents failing to meet the CDS for calcium, iron, vitamin A, thiamin, riboflavin, niacin and ascorbic acid was noticeably high in both groups.

The median daily intake of nutrients and the body mass indices by age group are shown in Table III. At all ages in both populations (except Caucasian teenagers), the median intake was be-

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Table I—Median daily intake of nutrients and other nutritional measures in two groups of women

Nutrient or nutritional measure	Micmac Indians (n = 120)	Shubenacadie Caucasians (n = 115)	Significance of differences*
Energy (Cal)	1718	1725	NS
Carbohydrate (g)	192	174	NS
Protein (g)	61	70	P = 0.0006
Fat (g)	76	80	NS
Cholesterol (mg)	367	325	NS
Unsaturated fat (g)	5.68	5.87	NS
Saturated fat (g)	31.0	30.3	NS
Calcium (mg)	602	608	NS
Iron (mg)	10.53	10.98	NS
Vitamin A (IU)	3703	4664	P = 0.03
Thiamin (μg)	908	924	NS
Riboflavin (μg)	1338	1380	NS
Niacin (NE†)	13.45	15.00	P = 0.008
Ascorbic acid (mg)	53	57	NS
Overnight fast (h)	14.25	13.51	P = 0.027
No. of meals per day	3.25	3.35	NS
Fibre (g)	2.34	3.10	P = 0.003
Calorie range	982	788	P = 0.026
% carbohydrate	44.7	41.7	P = 0.002
% protein	14.0	16.1	P = 0.00001
% fat	40.6	41.2	NS
% alcohol	0.008	0.012	P = 0.001
PS ratio‡	0.186	0.176	NS
g fibre × 1000	1.36	1.708	P = 0.0004
Calorie range × 1000	576	455	P = 0.005
Ponderal index	12.44	12.70	NS
Body build index	0.034	0.033	NS
Skinfold thickness	1.59	1.56	NS

*NS = not significant. Only P values equal to or less than 0.05 are considered significant and shown here.

†NE = niacin equivalent; 1 NE = 1 mg niacin or 60 mg tryptophan.

‡Ratio of polyunsaturated to saturated fats.

Table II—Proportions of subjects failing to meet Canadian Dietary Standard (CDS) for women aged 19 to 35 years

Nutrient or nutritional measure	% of women	
	CDS	Indian (n = 120) / Caucasian (n = 115)
Energy (Cal)	2100	74.2 / 73.9
Protein (g)	41	10.8 / 2.6
Calcium (mg)	700	66.7 / 65.2
Iron (mg)	14	82.5 / 77.4
Vitamin A (IU)	3700	49.2 / 34.0
Thiamin (μg)	1100	71.7 / 73.9
Riboflavin (μg)	1300	45.8 / 44.3
Niacin (NE)	14	54.2 / 38.3
Ascorbic acid (mg)	30	19.2 / 13.0

more obese than Caucasian women according to both the ponderal and body build indices. Apart from the thiamin value, median intakes of the Indian women failed to meet the CDS more frequently than those of the Caucasians.

The records of 4 days' intake of summer food were compared with those of winter food kept by the same eight subjects — five Indian and three Caucasian women. The only significant differences were a higher saturated fat intake in winter (33.1 v. 25.8 g; P = 0.015) and a smaller calorie range/caloric intake value in winter (319 v. 606 g; P = 0.017).

A sample day's menu for a Micmac woman is shown in Table IV. We found that the most frequently consumed foods among Indians were potatoes and bread. The most popular protein foods were hamburger, fish, bologna, eggs, stew beef, pork and chicken. Indian pie made with beef or venison was consumed infrequently.

low the CDS for energy, calcium, iron and thiamin. The Indian women derived a significantly greater percentage of their total energy intake from carbohydrates and a lesser percentage from protein, and consumed less protein, calcium and fibre than the Caucasian women in the youngest age group.

In the middle age group the Indian women consumed significantly less protein, niacin, ascorbic acid and fibre, fasted longer and derived a greater percentage of their total energy intake from carbohydrate and a lesser percentage from protein. In the oldest age group Indian women were significantly

Table III—Comparison of median daily intake* of nutrients and body mass indices by age groups in the two groups of women

Nutrient or nutritional measure	Age (yr) and racial group					
	15 - 18		19 - 35		36 - 50	
	Indians (n = 26)	Caucasians (n = 24)	Indians (n = 74)	Caucasians (n = 50)	Indians (n = 20)	Caucasians (n = 41)
Energy (Cal)	1626	1946	1719	1713	1680	1656
Carbohydrate (g)	213	197	191	188	175	171
Protein (g)	58	74	61	70	64	65
Fat (g)	72	83	76	77	79	78
Calcium (mg)	583	770	603	609	590	585
Iron (mg)	9.7	10.9	10.6	11.3	11.0	10.7
Vitamin A (IU)	3323	4665	3889	4105	3525	5179
Thiamin (μg)	890	953	885	928	957	843
Riboflavin (μg)	1418	1528	1328	1297	1317	1333
Niacin (NE)	13.3	13.7	13.5	16.2	13.3	14.7
Ascorbic acid (mg)	66	57	50	69	55	49
Overnight fast (h)	13.91	14.78	14.26	13.60	14.00	12.83
Fibre (g)	2.13	2.71	2.36	3.26	2.56	2.90
% carbohydrate	45.95	42.75	44.75	41.40	41.55	41.38
% protein	12.6	15.55	14.15	15.95	16.05	16.20
Ponderal index	12.74	12.85	12.44	12.61	11.85	12.47
Body build mass	0.033	0.031	0.033	0.033	0.040	0.035

*Median intakes below the CDS are italicized. Only P values of less than 0.05 are shown for differences between the paired values in each age group.

Table IV—Sample menu from 4-day food record of Indian woman aged 23, 163 cm tall, weighing 64 kg

Meal	Components
Breakfast	1 cup of tea with 2 tsp of evaporated milk 1 egg fried in bacon fat 2 strips of bacon 2 slices of homemade bread 2 tsp of margarine 2 dozen pumpkin seeds
Morning snack	50 g of chocolate cake (no icing)
Lunch	1 cup of tea with 2 tsp of evaporated milk About 15 french fries 1 slice homemade bread 1 tsp margarine
Supper	2 cups of scalloped potatoes made with potatoes, mushroom soup, egg, milk 1½ slices of bread 2 tsp of margarine 112 g of deer meat fried in margarine 1 cup of tea with 2 tsp of evaporated milk
Evening snack	1 cup of coffee with 1 tbsp of evaporated milk 50 g of chocolate cake (no icing) 1 slice of homemade bread 1 tsp of margarine

Most of the women (89.2%) met the CDS for protein. Carrots, turnips, cab-

bage and onions were the frequently eaten vegetables. Apples and oranges were eaten occasionally and powdered fruit-flavoured drinks were popular. Lard and hydrogenated vegetable fat were used equally for cooking, and butter-margarine blends were usually used at the table.

The Caucasian women consumed a diet similar to that of the Indians. Their largest meal was in the evening. They ate breakfast early or not at all and their lunches consisted of soup, sandwiches or macaroni and cheese. The chief difference in their food consumption from that of the Indian women was larger quantities of meat, especially at the evening meal, and smaller amounts of potatoes and bread. They also ate a larger variety of vegetables. Most (97.4%) met the CDS for protein. Coffee was the usual beverage and, except for adolescent girls who drank milk, milk consumption was limited to that used in tea and coffee.

Discussion

The Micmac Indians originally occupied Nova Scotia, Prince Edward Island, northern New Brunswick and part of the Gaspé peninsula. They hunted moose, caribou and other woodland game throughout the winter and

moved to the seashore in the spring to gather shellfish, to fish at river mouths and to hunt seals.¹⁶

The Shubenacadie Micmac reserve (population, 580) was established in 1941 to centralize 20 small reserves set up in 1779.

The comparison group in this study was the female Caucasian population of Shubenacadie village (population, 812), which was founded by English and Scottish immigrants in 1814 and had an influx of Dutch immigrants after World War II.

Food intake was adequately recorded and analysis was performed for the data of 91% of the Micmac and 87% of the Caucasian women. The Micmac women, who we found to have a high prevalence of gallstones, were obtaining a significantly greater proportion of their total energy intake from carbohydrates and had a wider calorie range from day to day. Conversely, the Caucasian women, who had less gallstone disease, were eating more protein and fibre-containing foods and obtaining more calories from protein. In a recent review of the epidemiology of gallstone disease, consumption of large amounts of highly refined carbohydrates was postulated to be a major reason for obesity in populations with a high prevalence of gallstones.¹⁷ Populations consuming small quantities of refined carbohydrates have a much lower prevalence of gallstones. In animals a diet with a large proportion of carbohydrates, usually sugar, will promote gallstone formation. Epidemiologic studies have linked conditions of overconsumption (obesity, gallstones and diabetes mellitus) with diseases of colonic stasis (diverticular disease, hemorrhoids and constipation). The latter disorders are also attributed to the consumption of diets high in refined carbohydrates and low in dietary fibre. Thus, the common link for all these disorders is the ingestion of refined carbohydrates, which cause what Cleave, Campbell and Painter¹⁸ have described as "the Saccharine disease".

In our study half the Indian and two fifths of the Caucasian population were obese and both groups had inadequate intake of fibre. The proportion of the total energy intake contributed by carbohydrates was greatest in the Indians less than 35 years of age, when gallstone disease is most common. The indices of body build were significantly different only for the groups over 35 years of age, the Indians being more obese. The incongruence of obesity with low caloric intake in both populations is similar to the findings of Nutrition Canada's national and Indian surveys.^{15,19}

The median daily intake of calcium among the Indian adolescents, who

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drank less milk than their Caucasian counterparts, was inadequate; the median intake for the adults, although slightly below the CDS, was adequate as classified by Nutrition Canada.

Iron intake was inadequate in the adolescent Indians and marginal (as defined by Nutrition Canada) in all other groups of Indians and Caucasians. These findings parallel those of the Nutrition Canada surveys.

Although the median daily intake of thiamin in all age groups was below the CDS (1100 µg) it would be considered adequate by the Nutrition Canada standard (800 µg or more).

The median daily intakes of riboflavin, niacin and ascorbic acid were above the standards of adequacy set by Nutrition Canada, although occasionally they did not reach the CDS values. The median daily intake of vitamin A was adequate in all groups except the adolescent Indians, and in each age group the intake was lower in the Indians than in the Caucasians. These findings are similar to those of the Nutrition Canada surveys.

We have previously reported that the precursor state of cholesterol gallstone formation, cholesterol-saturated or lithogenic bile, is found more often in women than in men during prolonged overnight fasting; the longer the fast, the more lithogenic the bile²⁰. Consequently, in the present study we determined the duration of overnight fast in the two populations and found that the Indian women, in whom gallstones were more common, fasted significantly longer than did the Caucasian women.

The many dietary similarities be-

tween our study groups and the Nutrition Canada survey findings suggest that the diets of the Shubenacadie Caucasian and Micmac Indian women are somewhat representative of the Canadian diet. Since we have found a high prevalence of gallstones in Micmac Indian women,⁸ presumably the general population of Canadian women has a similarly high prevalence if diet is important in the pathogenesis of gallstones.

Currently we are collecting bile specimens from a large sample of the Indian population for estimation of cholesterol saturation; cholesterol-saturated or supersaturated bile is a prerequisite for cholesterol gallstone formation. Presumably dietary manipulation — reducing the proportion of refined carbohydrates, increasing the fibre content and avoiding prolonged fasting — and reduction of obesity could lead to reversal of the bile abnormality and perhaps prevent gallstone formation.

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La potomanie: réévaluation des épreuves d'investigation et présentation inhabituelle avec hydronéphrose et mégavessie

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Les auteurs rapportent trois cas de potomanie, diagnostiqués comme diabète insipide lors d'hospitalisations antérieures. Deux de ces cas s'accompagnent de pyélocaliectasie ou de mégavessie, ou les deux, tel que décrit dans le diabète insipide surtout d'origine rénale. L'épreuve au salin hypertonique (Hickey-Hare) n'a été

positive que dans un cas. Les résultats de la restriction liquidienne suivie d'une injection intraveineuse de vasopressine (le test de Miller) favorisaient un diagnostic de diabète insipide complet. Ces deux épreuves ne permettent par conséquent pas d'exclure une potomanie. Les indices qui orientent vers le diagnostic de potomanie sont une osmolalité sanguine basse, une chute de la diurèse des 24 heures parallèle à la restriction d'apport, et des troubles du comportement. Le diagnostic est confirmé par une épreuve de déshydratation de 18 heures, faite après une restriction liquidienne

graduelle, qui favorise la restauration partielle du gradient osmotique papillaire.

Three cases of compulsive polydipsia previously diagnosed as diabetes insipidus are presented. Abnormally dilated bladder and pyelocalyceal systems were accompanying features, as previously described for diabetes insipidus, particularly of renal origin. Results of the hypertonic saline (Hickey-Hare) test were positive in only one case. Results of restriction of liquids followed by intravenous injection of vasopressin (Miller test) favoured a diagnosis of complete

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